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Contribution to the lichen mycota of South Korea

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Abstract — The present paper briefly describes 14 subtropical to temperate lichen species new to South Korea. Among the genera *Bacidia, Cresponea, Diploschistes, Fissurina, Fuscidea, Micarea, Mycoblastus, Phyllopsora, Sarcogyne, Scoliciosporum,* and *Toninia* reported for the first time from South Korea, *Fuscidea recensa* var. *arcuatula, Micarea elachista, Sarcogyne privigna,* and *Toninia cinereovirens* also represent new records for East Asia, including China and Japan.

Key words — geographical distribution, lichen-forming fungi, taxonomy

Introduction

In common with other areas of East Asian regions, the lichen flora of South Korea (34–38°N, 126–130°E) is little known. Hur et al. (2005) provided an annotated checklist of the lichenized fungi of South Korea based on critical review of archival manuscripts and published literature records and reported 510 species belonging to 113 genera. Further examination of herbarium material lodged at Korean Lichen Research Institute (KoLRI) and recent collections made by the authors have revealed 11 genera and 14 species that have not been previously reported from this country. These species are in addition to those reported earlier by Joshi et al. (2009a–c, 2010a–h). It is expected that future collections will add more genera and species to the lichen biota of South Korea.

The genera *Bacidia* De Not., *Cresponea* Egea & Torrente, *Diploschistes* Norman, *Fissurina* Feé, *Fuscidea* V. Wirth & Vězda, *Micarea* Fr., *Mycoblastus* Norman, *Phyllopsora* Müll. Arg., *Sarcogyne* Flot., *Scoliciosporum* A. Massal. and

Toninia A. Massal. are reported for the first time in South Korea. *Cresponea proximata, Diploschistes scruposus, Fuscidea recensa* var. *arcuatula,* and *Toninia cinereovirens* were collected from the maritime regions of South Korea.

The intent of this work is to provide users with the geographical distribution of lichens in South Korea, expand the knowledge of lichen diversity in East Asia including China and Japan, and add some new records to the South Korean lichen checklist of Hur et al. (2005). Brief taxonomic descriptions, comments, and photographs of each species are provided along with chemical and ecological data.

Materials & methods

The study is based on lichen specimens lodged in herbarium of Korean Lichen Research Institute (KoLRI), Sunchon National University, South Korea, as well as fresh samples collected during recent field trips in various parts of the country. Specimens were examined using standard microscopic techniques and hand-sectioned under NIKON C-PS 1068908 dissecting microscope. All measurements were taken from material mounted in water; lactophenol cotton blue was used only as a stain. For characters such as size of the thallus, ascomata and thickness of the hymenium, subhymenium, hypothecium, exciple, ascospores dimension, ten measurements were recorded per specimen. Ascospore dimensions are generally presented as smallest mean recorded to the largest mean. Spot test reactions were carried out on hand sections of thalli and apothecia under the microscope OLYMPUS BX 50. Secondary metabolites were identified by TLC as described by Orange et al. (2010) using solvent system C and EA (used for the separation of lecanoric and gyrophoric acids). HCl was used to detect the nature of rock (bubbles indicate calcareous rock).

Taxonomy

Bacidia arceutina (Ach.) Rehm & Arnold, Verh. zool.-bot. Ges. Wien 19: 624, 1869

Fig. 1A

≡ *Lecidea luteola* var. *arceutina* Ach., Method. Lich.: 61, 1803

Specimens Examined – **SOUTH KOREA: Gyeongbuk Prov.:** Mungyeong Co., Mt. Juhul, 36°46′30.1″N, 128°06′12.6″E, alt. 788 m, on bark, 29 February 2004, J.-S. Hur 040131 (KoLRI); Mt. Joryeong, 37°48′27″N, 128°03′32″E, alt. 500 m, on bark, 10 July 2008, J.-S. Hur 080306 (KoLRI); **Kangwon Prov**.: Pyeongchang Co., Mt. Hwangbyong, 37°44′44.3″N, 128°37′30.4″E, alt. 779 m, on bark, 14 July 2008, J.-S. Hur 080380 (KoLRI); 37°44′47.6″N, 128°37′31.5″E, alt. 772 m, on bark, 14 July 2008, J.-S. Hur, 080416 (KoLRI); 37°44′52.3″N, 128°37′33.2″E, alt. 751 m, on bark, 14 July 2008, J.-S. Hur 080404 (KoLRI); Mt. Seokpyeong, 37°34′57.3″N, 128°52′27.1″E, alt. 870 m, on bark, 24 May 2008, J.-S. Hur 080229 (KoLRI); **Jeonnam Prov.:** Hwasun Co., Doam-myeon, Caecho-ri, Mt. Cheonbul, Unju-sa, 34°55′13.2″N, 126°52′51.7″E, alt. 70 m, on bark, 04 September 2005, J.-S. Hur 050381 (KoLRI).

Brief description — Thallus corticolous, determinate, thin, continuous, smooth to minutely granular-warted, pale green-gray. Prothallus absent. Apothecia numerous, 0.4–0.8 mm diam., at first plane and marginate but

often becoming convex and immarginate, pale brown. Proper exciple without crystals. Rim pigmented in a distinct zone, dark yellow-brown to brown in upper part, downwards changing to pale yellow or colourless. Epithecium yellowish-brown, K–, N–. Hymenium colourless. Hypothecium straw or yellow-brown, K± intensifying yellow. Spores hyaline, acicular, 45–70 × 1.3–2.5 µm, 3–7 septate.

Chemistry — Spot test reactions: thallus and apothecia K–, C–, KC–, P–, N–. Secondary metabolites: none detected.

Ecology & distribution — The collections were found growing over *Quercus* bark between elevations of 70–870 m. Known also from Europe, Africa, Asia, and North America (Smith et al. 2009).

Remarks — *Bacidia schweinitzii* and *B. subincompta* (also reported here as new records) are the only other two *Bacidia* species known from South Korea. They differ in having bluish-green epithecium that is always N+ purple violet. The bluish-green epithecium observed in some specimens of *B. arceutina* may lead to confusion with the former two species, but can be easily separated from them in having colourless to straw or yellow-brown hypothecium which is K+ intensifying yellow. For further descriptions see Ekman (1996).

Bacidia schweinitzii (Fr. ex E. Michener) A. Schneid, Guide Study Lich.: 110, 1898 Fig. 1B

≡ *Biatora schweinitzii* Fr. ex E. Michener, Flora Cestrica, ed. 3: 447, 1853

Specimens Examined – **SOUTH KOREA: Gyeongbuk Prov.:** Mungyeong Co., Mt. Joryeong, 37°48′27″N, 128°03′32″E, alt. 500 m, on bark, 10 July 2008, J.-S. Hur 080329 (KoLRI); **Jeju Island,** Mt. Halla 33°26′04.4″N, 126°34′01.7″E, alt. 530 m, on bark, 29 August 2004, J.-S. Hur 040876-1 (KoLRI); **Kangwon Prov.**: Pyeongchang Co., Mt. Hwangbyong, 37°44′41.3″N, 128°37′31.0″E, alt. 630 m, on bark, 14 July 2008, J.-S. Hur 080364 (KoLRI).

Brief description — Thallus corticolous, indeterminate, thin, of discrete granules or continuously granular, gray to green-gray. Granules ± globose. Prothallus absent. Apothecia numerous, 0.3–0.8 mm diam., at first plane but later becoming convex, solitary, orange-brown to blue-black to pure black. Proper exciple with radiating clusters of crystals. Rim colourless to dark brown, often bluish-green near the hymenium. Epithecium blue-green, K–, N+ purple violet. Hymenium colourless. Hypothecium orange-brown to dark brown. Spores hyaline, acicular, 40–68 × 2.5–3 µm, 3–7 septate.

Chemistry — Spot test reactions: thallus and apothecia K–, C–, KC–, P–, N–. Secondary metabolites: none detected.

Ecology & distribution — The collections were found growing over *Quercus* bark between 500–630 m. Known also from Eastern Asia (China, Japan), and North America (Ekman 1996).

Remarks — The brown hypothecium of *B. schweinitzii,* which gradually merges with dark coloured proper exciple near the base, separates it from *B. subincompta,* where the hypothecium forms a ± distinct zone. Further, yellowish to orange-brown hypothecial region is K+ intensifying in *B. schweinitzii,* and lacking in *B. subincompta*. The colourless or pale straw-coloured hypothecium of *B. arceutina* separates it from *B. schweinitzii.* For further descriptions see Ekman (1996).

Bacidia subincompta (Nyl.) Arnold, Flora, Jena 53: 472, 1870 Fig. 1C

≡ *Lecidea subincompta* Nyl., Flora, Jena 48: 147, 1865

Specimens Examined – **SOUTH KOREA: Kangwon Prov.:** Pyeongchang Co., Mt. Hwangbyong, 37°44′52.3″N, 128°37′33.2″E, alt. 751 m, on bark, 14 July 2008, J.-S. Hur 080404 (KoLRI); 37°44′53.0″N, 128°37′31.9″E, alt. 776 m, on bark, 14 July 2008, J.-S. Hur 080455 (KoLRI); **Jeju Island,** Mt. Halla 33°23′18.1″N, 126°29′345.1″E, alt. 975 m, on bark, 27 August 2004, J.-S. Hur 040689 (KoLRI); **Gyeongbuk Prov.**:: Mungyeong Co., Mt. Joryeong, 37°48′27″N, 128°03′32″E, alt. 500 m, on bark, 10 July 2008, J.-S. Hur 080301 (KoLRI).

Brief description — Thallus corticolous, determinate, thin to thick, either discontinuous, of discrete low convex areoles, or continuous, without cracks, gray to gray-green to greenish-brown. Prothallus absent. Apothecia numerous, 0.2–1.1 mm diam., at first plane but later becoming convex, solitary to ±clumped, blue-black to pure black. Proper exciple without crystals. Rim colourless to red-brown to black-brown, often with a bluish-green tinge in upper part. Epithecium green to bluish-green, K–, N+ purple violet. Hymenium colourless. Hypothecium dark red-brown, K± purple in upper part, pale red-brown below. Spores hyaline, fusiform, bacilliform or acicular, 25–32 × 2–3 µm, 3–7 septate.

Chemistry — Spot test reactions: thallus and apothecia K–, C–, KC–, P–, N–. Secondary metabolites: none detected.

Ecology & distribution — The collections were found growing over *Quercus* bark at 500–975 m. Known also from Africa, Asia, Europe, Macaronesia, and North America (Smith et al. 2009).

Remarks — For comparisons, see *B. arceutina* and *B. schweinitzii* above. For further descriptions see Ekman (1996).

Cresponea proximata (Nyl.) Egea & Torrente, Mycotaxon 48: 328, 1993 Fig. 1D

≡ *Lecidea proximata* Nyl., Ann. Sci. Nat. Bot., sér. 4, 19: 356, 1863

Specimens Examined – **SOUTH KOREA: Jeonnam Prov.**: Yeosu city, Geomun Island, 34°00′38.5″N, 127°19′10.8″E, alt. 46 m, on *Camellia japonica* bark, 24 March 2007, J.-S. Hur 070128, 070130 (KoLRI); 34°00′37.1″N, 127°19′13.0″E, alt. 21 m, on bark, 24 March 2007, J.-S. Hur 070131 (KoLRI); Wando Co., Bogil-myeon, Bogil Island, Yesong-ri, near Yesong beach trail, 34°08′30.2″N, 126°33′48.3″E, alt. 2 m, on bark, 06 February 2010, Y. Joshi & party 100241, 100244, 100247, 100246-2, 100250, 100251 (KoLRI).

Brief description — Thallus corticolous, continuous, cracked-areolate, smooth, gray to green. Hypothallus ± present, brownish. Photobiont *Trentepohlia*. Apothecia numerous, scattered, sessile, constricted at base, 0.3–1.2 mm diam., with a smooth to ±crenulate margin. Disc plane to slightly convex, black, with green to ochraceous-yellowish pruina. Hymenium I+ reddish. Paraphysoids with thickened apical cell having dark brown cap formed in the outer part of cell wall. Spores hyaline, fusiform, 25–35(–38) × 5–7 µm, (1–)5–7 septate, straight to slightly curved.

Chemistry — Spot test reactions: thallus K–, C–, KC–, P–. Secondary metabolites: none detected.

Ecology & distribution — The collections were found growing over bark along the coast at elevations of 2–46 m. Known also from Indo-Malaya, the Caribbean, Brazil, China, and Japan (Egea & Torrente 1993).

Remarks — So far *C. proximata* is the only *Cresponea* species known from South Korea. It is often confused with *C. premnea* (Ach.) Egea & Torrente, which can be distinguished by smaller spores (20–27 µm) and paraphysoids with dark brown cap formed in the inner part of the cell wall. For further descriptions see Egea & Torrente (1993).

Diploschistes actinostomus (Pers. ex Ach.) Zahlbr., Hedwigia 31: 34, 1892 Fig. 1E

≡ *Verrucaria actinostoma* Pers. ex Ach., Lich. univ.: 288, 1810

Specimens Examined – **SOUTH KOREA: Jeonnam Prov.**: Jangheung Co., Gwansan-eup, Mt. Cheonkwan, 34°32′47.2″N, 126°55′39.6″E, alt. 300 m, on rock, 06 October 2005, J.-S. Hur 050648 (KoLRI); Mt. Cheonkwan, near Gwansan, 34°32′50.6″N, 126°55′43.3″E, alt. 200 m, on rock, 06 October 2005, L. Lőkös (BP).

Brief description — Thallus saxicolous, thick, glossy, smooth, rimose-areolate, whitish-gray, epruinose. Photobiont trebouxioid. Apothecia numerous, conspicuous, solitary, perithecioid. Pores small, rounded, black. Spores broadly ellipsoid, brown, non-amyloid, 16–22 × 10–12 µm, with 4–6 transverse septa and 1–3 longitudinal septa.

Chemistry — Spot test reactions: thallus K–, C+ red, KC–, P–. Secondary metabolites: lecanoric acid (major) and gyrophoric acid (minor).

Ecology & distribution — The collections were found growing over non-calcareous rocks at 200–300 m. Cosmopolitan (Rivas Plata et al. 2010).

Remarks — *Diploschistes scruposus*, the other species of this genus known from South Korea and reported here as new record, differs in having urceolate ascomata, while ascomata in *D. actinostomus* are perithecioid. *Diploschistes diploschistoides* (Vain.) G. Salisb., a related species with perithecioid ascomata, differs in longer (30–52 µm), amyloid spores. For further descriptions see Mangold et al. (2009).

Diploschistes scruposus (Schreb.) Norman, Nytt Mag. Natur. 7: 232, 1853 Fig. 1F

≡ *Lichen scruposus* Schreb., Spic. Fl. Lips.: 133, 1771

Specimen Examined – **SOUTH KOREA: Jeonnam Prov.**, Goheung Co., Sorok Island, alt. 15 m, on rock, 23 March 2003, J.-S. Hur 030065 (KoLRI).

Brief description — Thallus saxicolous, thick, rimose-areolate, greenish-gray, surface uneven to verrucose, scabrid, epruinose. Photobiont trebouxioid. Apothecia numerous, conspicuous, solitary, urceolate, 1–1.5 mm diam. Disc visible from above, blackish-brown, ± grayish pruinose. Spores ellipsoid, brown, non-amyloid, 22–36 × 10–16 µm, with 4–7 transverse septa and 1–3 longitudinal septa.

Chemistry — Spot test reactions: thallus K–, C+ red, KC–, P–. Secondary metabolites: lecanoric acid.

Ecology & distribution — The collection was found growing over non-calcareous rocks. Cosmopolitan (Rivas Plata et al. 2010).

Remarks — *D. gypsaceus* (Ach.) Zahlbr., a related species with urceolate ascomata, differs in pruinose thallus, 4-spored asci and its typifically calcareous substratum. *D. rampoddensis* (Nyl.) Zahlbr. differs in having yellowish-gray to orange-yellow thallus, narrowly ellipsoid spores (7–12 µm wide), and pantropical distribution. For further descriptions see Mangold et al. (2009).

Fissurina insidiosa C. Knight & Mitt., Trans. Linn. Soc. London 23: 102, 1860

Fig. 1G

Specimen Examined – **SOUTH KOREA: Jeju Island**, Mt. Halla, 33°22′77.5″N, 126°33′74.9″E, alt. 1000 m, on bark, 21 April 2009, J.-S. Hur 090100 (KoLRI).

Brief description — Thallus corticolous, thin, cracked and fissured, glossy, greenish-gray. Apothecia (lirellae) inconspicuous, immersed, indicated by a thin line between two lips, sometimes slightly open, somewhat raised and paler than the thallus, straight, curved or sinuous, 1–3 mm long. Thalline exciple sometimes raised around the lirellae or sometimes flush. Apothecia *subcontexta*-type (see Staiger 2002). Spores 4-locular, 18–20 × 8–10 µm.

Chemistry — Spot test reactions: thallus K–, C–, KC–, P–. Secondary metabolites: none detected.

Ecology & distribution— The collection was found growing over bark at 1000 m. Known also from New Zealand (Hayward 1977).

Remarks — So far *F. insidiosa* is the *Fissurina* species known from South Korea. In external morphology it is close to *F. dumastii* Fée, which differs in having *dumastii*-type apothecia. *Dumastii*-type mature apothecia are characterized by erumpent lirellae with thin labia and a partly exposed disc, while *subcontexta*-types have prominent lirellae with thick labia and hidden discs. For further descriptions see Staiger (2002).

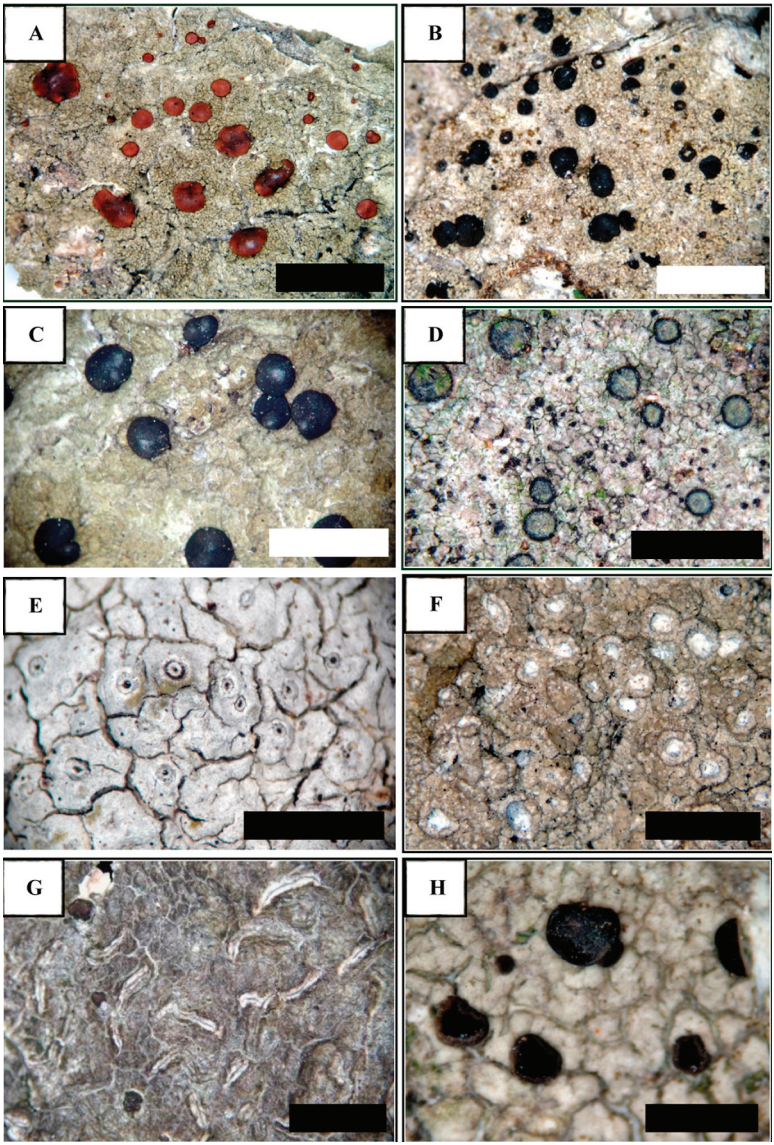

Fig. 1. New records examined in the present study. **A.** *Bacidia arceutina,* 080229 (KoLRI); **B.** *B. schweinitzii,* 080329 (KoLRI); **C.** *B. subincompta,* 080404 (KoLRI); **D.** *Cresponea proximata,* 070131 (KoLRI); **E.** *Diploschistes actinostomus,* 050648 (KoLRI); **F.** *D. scruposus,* 030065 (KoLRI); **G.** *Fissurina insidiosa,* 090100 (KoLRI); **H.** *Fuscidea recensa* var. *arcuatula,* 070097 (KoLRI). Scale = 3 mm.

Fuscidea recensa* var. *arcuatula (Arnold) Fryday, Lichenologist 40: 313, 2008 Fig. 1H

≡ *Biatora arcuatula* Arnold, Flora 71: 107, 1888

Specimen Examined – **SOUTH KOREA: Jeonnam Prov.**: Yeosu city, Geomun Island, 34°00′38.7″N, 127°19′01.2″E, alt. 10 m, on rock, 24 March 2007, J.-S. Hur 070097 (KoLRI).

Brief description — Thallus saxicolous, areolate, areoles usually contiguous, discrete, rounded and tuberculate, pale gray, growing in zoned patches one against another. Prothallus dark brownish-black. Soredia absent. Apothecia numerous, sessile, broadly attached, lead coloured, brownish when wet, 0.4–0.6 mm diam. Disc plane to slightly convex. Spores hyaline, ellipsoid, curved, 9–12 × 3.5–4.5 µm.

Chemistry — Spot test reactions: thallus and medulla K–, C–, KC–, P–. Medulla UV+ white. Secondary metabolites: divaricatic acid.

Ecology & distribution — The collection was found growing over non-calcareous rocks at 10 m along the coast. Also known from Europe, North America, and Indonesia (Smith et al. 2009); new to East Asia.

Remarks — So far *F. recensa* var. *arcuatula* is the only *Fuscidea* representative known from South Korea. It is often confused with *F. recensa* (Stirt.) Hertel et al. var. *recensa,* which has a sorediate thallus and thick persistent proper margin. Although Fryday (2008) noted the non-sorediate nature of some specimens of *F. recensa* var. *recensa,* their thick white thallus and thin proper margin separate them from *F. recensa* var. *arcuatula.* For further descriptions see Fryday (2008).

Micarea elachista (Körb.) Coppins & R. Sant., Bull. Br. Mus. nat. Hist. (Bot.) 11: 131, 1983 Fig. 2A

≡ *Biatora elachista* Körb., Parerga lichenol. (Breslau): 159, 1860

Specimen Examined – **SOUTH KOREA: Kangwon Prov.**: Pyeongchang Co., Mt. Odae, Duro Peak, 37°45′52.7″N, 128°36′35.2″E, alt. 1081 m, on bark, 15 July 2008, J.-S. Hur 080488 (KoLRI).

Brief description — Thallus corticolous, continuous, areolate, greenish-gray. Photobiont micareoid. Apothecia numerous, immarginate, convex to globose, 0.2–0.4 mm diam., brown to brownish-black. Epithecium dark brown. Hymenium colourless, with yellowish brown vertical streaks. Spores hyaline, fusiform to oblong-fusiform, 0–1(–3) septate, 11–15 × 2–3 µm.

Chemistry — Spot test reactions: thallus K–, C–, KC–, P–. Secondary metabolites: none detected.

Ecology & distribution — The collection was found growing over bark at an elevation of 1081 m. Known also from Europe, Australia, and North America (Coppins 1983; Smith et al. 2009); new to Asia.

Remarks — So far *M. elachista* is the only *Micarea* species known from South Korea. It has often been confused with *M. denigrata* (Fr.) Hedl., which can be distinguished by C+ red apothecia in sections (due to presence of gyrophoric acid). The related species *M. rhabdogena* (Norman) Hedl. can be differentiated by an endoxylic thallus and smaller, mostly simple spores. For further descriptions see Coppins (1983).

Mycoblastus sanguinarius (L.) Norman, Cat. Lich. Univers. 4: 5, 1926 Fig. 2B

≡ *Lichen sanguinarius* L., Sp. pl. 2: 1140, 1753

Specimens Examined – **SOUTH KOREA: Gyeongnam Prov.**: Sanchung Co., Jungsan-ri, Mt. Jiri, 35°20′06.9″N, 127°42′47.1″E, alt. 1530 m, on *Acer* bark, 16 September 2006, J.-S. Hur 060735 (KoLRI); **Jeonnam Prov.**: Kwangyang City, Mt. Baekwoon, 35°37′18.5″N, 127°37′51.1″E, alt. 1160 m, on rock, 17 August 2006, J.-S. Hur 060626 (KoLRI).

Brief description — Thallus corticolous, thick, verrucose or papillose-warted, continuous to ± cracked, gray. Prothallus present, grayish-black. Hypothecium carmine to blood-red. Apothecia numerous, 0.3–1.2 mm diam., appressed or sessile leaving a bright carmine-red spot when damaged, convex, black. Asci 1-spored. Spores hyaline, broadly ellipsoid, 70–84 × 30–40 µm. Pycnidia not seen. For further descriptions see Smith et al. (2009) and Kantvilas (2009).

Chemistry — Spot test reactions: thallus K+ yellow, C–, KC–, P+ yellow. Secondary metabolites: atranorin and caperatic acid.

Ecology & distribution — The collections were found growing over *Acer* bark and siliceous rocks at 1160–1530 m. Known also from Asia, Africa, Europe, Macaronesia, and North America (Smith et al. 2009, Kantvilas 2009).

Remarks — So far *M. sanguinarius* is the only *Mycoblastus* species known from South Korea. It has often been confused with *M. sanguinarioides* Kantvilas, which differs in rather thin, smooth thallus and its distribution in the Southern Hemisphere (Tasmania, Australia). The related species *M. affinis* (Schaer.) T. Schauer differs by lacking red pigment at the apothecial base, smaller spores (less than 70 µm), and the presence of planaic acid.

Phyllopsora corallina (Eschw.) Müll. Arg., Bot. Jb. 20: 264, 1894 Fig. 2C

≡ *Lecidea corallina* Eschw., Fl. Bras. Enum. Pl. 1: 256, 1833

Specimen Examined – **SOUTH KOREA: Kangwon Prov.**: Injae Co., Baekdam Temple, 38°11′16.4″N, 128°21′42.7″E, alt. 450 m, on rocks, 11 October 2004, J.-S. Hur 041503 (KoLRI).

Brief description — Thallus corticolous, squamulose, squamules round or elongate, adnate to ±ascending, scattered when young, later contiguous or imbricate, tan coloured. Upper surface glabrous. Prothallus well developed, white. Cortex type 2. Isidia numerous, attached marginally to the squamules, cylindrical, simple or rarely branched, tips brownish-black coloured. Apothecia not seen.

Chemistry — Spot test reactions: thallus K–, C–, KC–, P–. Secondary metabolites: none detected.

Ecology & distribution — The collection was found growing over non-calcareous rock at an elevation of 450 m. Known also from Asia, North and South America, Australia, and Africa (Brako 1991).

Remarks — So far *P. corallina* is the only *Phyllopsora* species known from South Korea. It is close to *P. africana* Timdal & Krog, *P. kiiensis* (Vain.) Gotth. Schneid., *P. martinii* Swinscow & Krog, and *P. swinscowii* Timdal & Krog, in having marginally attached isidia, but it differs in chemistry. *Phyllopsora africana* and *P. martinii* contain argopsin and chlorophyllopsorin, *P. kiiensis* has furfuracein, and *P. swinscowii* contains methyl 2,7-dichloropsoromate and methyl 2,7-dichloronorpsoromate. For further descriptions see Brako (1991) and Timdal & Krog (2001).

Sarcogyne privigna (Ach.) A. Massal., Geneac. Lich.: 10, 1854 Fig. 2D

≡ *Lecidea privigna* Ach., Method. Lich.: 49, 1803

Specimen Examined – **SOUTH KOREA: Jeonnam Prov.**: Hwasun Co., Mt. Baega, 35°10′14.1″N, 127°08′44.9″E, alt. 490 m, on rock, 08 October 2005, L. Lőkös 050671 (BP, KoLRI); **Kangwon Prov.**: Okgye Co., Gangneung city, Mt. Jabyung, 37°33′16.6″N, 128°58′46.5″E, alt. 360 m, on rock, 19 May 2010, J.-S. Hur s.n. (KoLRI).

Brief description — Thallus saxicolous, endolithic or inconspicuously developed, with gray ecorticate regions occurring below the apothecia. Apothecia numerous, sessile, round to ±irregular, dispersed or contiguous, 0.5–1.3 mm diam., red to blackish-red. True exciple black, persistent. Hymenium up to 95 µm tall. Hypothecium pale brown. Asci multi spored, *c.* 200-spored. Spores hyaline, cylindrical to oblong, 4–5 × 1–2 µm.

Chemistry — Spot test reactions: thallus K–, C–, KC–, P–. Secondary metabolites: none detected.

Ecology & distribution — The collections were found growing over siliceous rocks at an elevation of 490 m. Known also from Asia, Europe, North America, Africa, and Australia (Smith et al. 2009); new to East Asia.

Remarks — So far *S. privigna* is the only *Sarcogyne* species known from South Korea. In external morphology it is often confused with *S. clavus* (DC.) Kremp., which differs in having dark brown hypothecium, a taller hymenium, a crenulate true exciple, and a more or less coastal distribution. For further descriptions see Magnusson (1935) Knudsen & Standley (2007).

Scoliciosporum umbrinum (Ach.) Arnold, Flora, Jena 54: 50, 1871 Fig. 2E

≡ *Lecidea umbrina* Ach., Lich. univ.: 183, 1810

Specimens Examined – **SOUTH KOREA: Jeonnam Prov.**: Kwangyang City, Mt. Baekwoon, 35°06′55.8″N, 127°36′26.5″E, alt. 875 m, on bark, 27 June 2006, J.-S. Hur 060393 (KoLRI); 35°06′55.3″N, 127°36′31.6″E, alt. 904 m, on bark, 27 June 2006, J.-S.

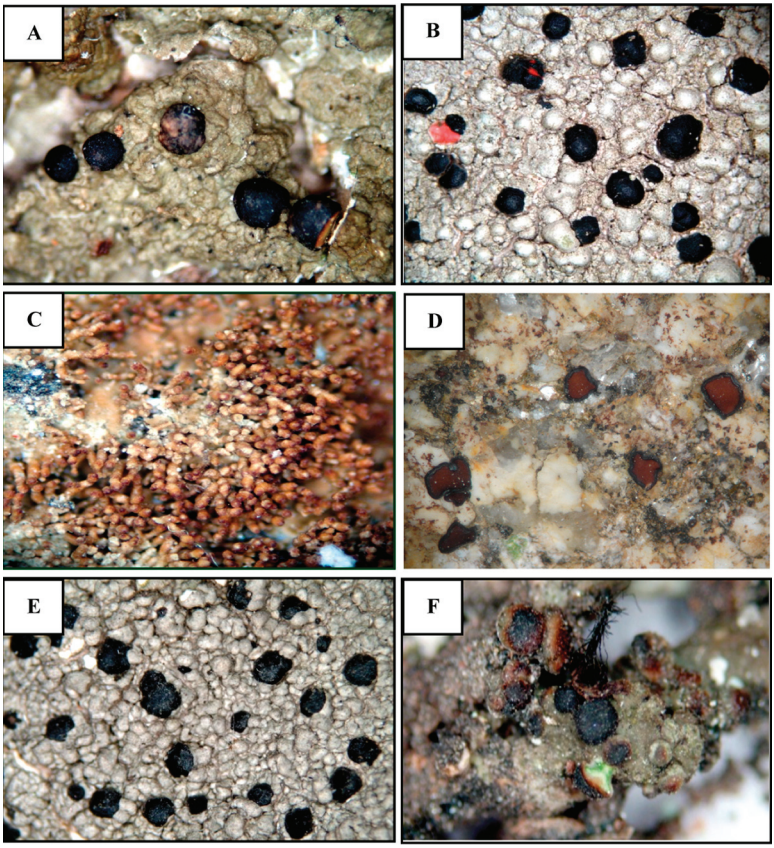

Fig. 2. New records examined in the present study. **A.** *Micarea elachista,* 080488 (KoLRI); **B.** *Mycoblastus sanguinarius,* 060735 (KoLRI); **C.** *Phyllopsora corallina,* 041503 (KoLRI); **D.** *Sarcogyne privigna,* s.n. (KoLRI); **E.** *Scoliciosporum umbrinum,* 060396 (KoLRI); **F.** *Toninia cinereovirens,* s.n. (KoLRI). Scale = 3 mm

Hur 060396 (KoLRI); **Kangwon Prov.**: Mt. Seokpyeong, 37°34′29.9″N, 128°51′21.8″E, alt. 686 m, on bark, 24 May 2008, J.-S. Hur 080193 (KoLRI).

Brief description — Thallus corticolous, variable, thin, cracked, to rather thick, warted to almost granular, continuous, gray to greenish-gray. Apothecia numerous, plane to convex at maturity, 0.2–0.6 mm diam., brown to black. Epithecium blue-green (K–, N+ purple) or olive brown (K–, N–). Spores hyaline, acicular, 3–7 septate, 18–27 × 2–3 μm ±spirally arranged in the ascus. Pycnidia not seen.

Chemistry — Spot test reactions: thallus K–, C–, KC–, P–. Secondary metabolites: none detected.

Ecology & distribution — The collections were found growing over bark at 686–904 m. Cosmopolitan (Smith et al. 2009).

Remarks — So far *S. umbrinum* is the only *Scoliciosporum* species known from South Korea. Its external morphology and anatomical features resemble those of *S. sarothamni* (Vain.) Vězda, which differs in having gyrophoric acid. For further descriptions see Ekman & Tønsberg (2004).

Toninia cinereovirens (Schaer.) A. Massal., Ric. auton. lich. crost. (Verona): 107, 1852 Fig. 2F

≡ *Lecidea cinereovirens* Schaer., Lich. helv. spicil. 3: 109, 1828

Specimen Examined – **SOUTH KOREA: Jeonnam Prov.**: Gwangyang City, Tae in-dong, 34°56′63.2″N, 127°44′61.8″E, alt. 2 m, on rock, 2009, J.-S. Hur GW1028 (KoLRI).

Brief description — Thallus saxicolous, squamulose, indeterminate. Squamules up to 2 mm diam., contiguous to irregularly imbricate with free to ascending darker gray margin. Upper side brown, epruinose, lacking pores and pseudocyphellae. Under surface pale brownish. Apothecia up to 0.8 mm diam., epruinose. Epithecium olivaceous brown, K–, N–. Spores hyaline, bacilliform, 1–3 septate, 14–26 × 3–4 µm.

Chemistry — Spot test reactions: thallus K–, C–, KC–, P–. Secondary metabolites: None detected.

Ecology & distribution — The collection was found at 2 m along the coast growing over non-calcareous rocks. Known also from Europe (Timdal 1991); new to East Asia.

Remarks — So far *T. cinereovirens* is the only *Toninia* species known from South Korea. It has often been confused with *T. squalida* (Ach.) A. Massal., which differs in having acicular, 3–7 septate spores and non-imbricate squamulose thallus with margins ±appressed to the substratum. For further descriptions see Timdal (1991).

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